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Term: (pixel or pel or voxel) near5 (determ$6 or detect$4 or discrim$6 or calculat$4) near5 (background or foreground or (second$4 or

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## Search History

**DATE: Wednesday, March 03, 2004** Printable Copy Create Case

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| | *DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI; PLUR=YES; OP=OR* | | |
| L5 | (pixel or pel or voxel) near5 (determ$6 or detect$4 or discrim$6 or calculat$4) near5 (background or foreground or (second$4 or primary) near3 (image or pict$7)) and @ad<19990811 and (input or scan$4 or read$4 or recogn$6 or determin$4 or descrimina$4) near4(GREY OR GRAY) near4 (level or scale or image) | 137 | L5 |
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END OF SEARCH HISTORY

L5: Entry 1 of 137 File: USPT Sep 30, 2003

DOCUMENT-IDENTIFIER: US 6628808 B1
TITLE: Apparatus and method for verifying a scanned image

Application Filing Date (1):
19990728

Detailed Description Text (14):
FIG. 3C is a scanned data, data base 54 used to store the gray-scale image data of the scanned card 24. Once the algorithm loads a coordinate 53 and character 55 from the personalization data base 52 into a memory area 32 in the computer system 30, it will load the corresponding appropriate template of that character 51 from the character template data base 50. The algorithm then traces the corresponding character 59 at coordinates 57 from the scanned data, data base 54 according to the template character 51 to verify that it matches the character 55 at the coordinate 53 that is stored in the personalization data base 52.

Detailed Description Text (17):
According to one embodiment of the invention, an image verification algorithm is based on a topological analysis of the image. Standard recognition software relies on getting crisp bi-level separation between the foreground and the background of the image. However, the verification system according to one embodiment of the invention eliminates this step by performing a topological analysis based on a full gray-scale version of the scanned image.

Detailed Description Text (62):
Incorporating the anti-stroke technique to the bi-leveling outline technique helps to eliminate this particular problem. It also helps to eliminate the special case where the color topping placed on the card matches the background color. Since the bi-leveling algorithm relies on a differentiating between foreground and background pixels, it will detect this occurrence by determining how many pixels in the search window are classified as background. The algorithm will be able to eliminate mismatches if it detects that some threshold of the foreground pixels have been crossed (e.g. more than 40% of the pixels in the search window are all being marked as foreground). If so the algorithm assumes that the character foreground matches the background.

First Hit Fwd Refs

Generate Collection Print

L5: Entry 5 of 137 File: USPT May 28, 2002

DOCUMENT-IDENTIFIER: US 6396505 B1

**** See image for Certificate of Correction ****

TITLE: Methods and apparatus for detecting and reducing color errors in images

Abstract Text (1):
Display apparatus, and methods for displaying images, e.g., text, on gray scale and color monitors where each pixel includes multiple pixel sub-components are described. Filtering and/or displaced sampling is used to generate pixel sub-component luminous intensity values. As a result of treating pixel sub-components as distinct light emitters corresponding to different image portions, resolution is enhanced but color errors may be introduced into the image being displayed. Various techniques for detecting noticeable and/or distracting color errors are described. In addition, various techniques for correcting, compensating for, or reducing color errors are described. In one particular embodiment, red, green and blue pixel sub-component luminous intensity values are examined and compared to a range of luminous intensity values which is determined as a function of utilized foreground and background pixel colors. Pixel sub-component luminous intensity values which are determined to be outside the range of acceptable values are adjusted to fall within the range of acceptable values. In one particular embodiment, individual pixel sub-component luminous intensity values outside the range of acceptable values are clamped to the nearer of the foreground or background pixel sub-component luminous intensity value of the correspondingly colored pixel sub-component. In another embodiment sequential red and blue filters are used to reduce or compensate for color distortions.

Application Filing Date (1):
19990429

Brief Summary Text (39):
In accordance with one color error detection method of the present invention, each pixel's pixel sub-component luminous intensity values are compared to a range of luminous intensity values. The range of luminous intensity values to which a pixel sub-component's luminous intensity value is compared is determined as a function of the foreground and background pixel sub-component luminous intensity values of a corresponding pixel sub-component.

Detailed Description Text (61):
FIG. 14 shows the use of area filtering in a non-gray scale embodiment as part of a scan conversion operation. In particular, FIG. 14 illustrates performing a weighted scan conversion operation on the first column 1400 of a scaled hinted version of the image 1002 which has been scaled by a factor of 10 in the vertical direction and a factor of one in the horizontal direction. In FIG. 14, the portion of the hinted image which corresponds to a single pixel comprises 10 segments. In accordance with the weighted scaling technique discussed above, the first three segments or each pixel area of the scaled image are used to determine the luminous intensity value of a red pixel sub-component corresponding to a pixel in the bitmap image 1402. The next six segments of each pixel area of the scaled image 1400 are used to determine the luminous intensity value of a green pixel sub-component corresponding to the same pixel in the bitmap image 1402. This leaves the last segment of each pixel area of the scaled image 1400 for use in determining the

luminous intensity value of the blue pixel sub-component. In the case of one embodiment where uniform weighting of segments corresponding to a pixel sub-component is used, if half or more of the image segments are determined to be "on", then the pixel sub-component is turned "on" otherwise, the pixel sub-component corresponding to the image segments is turned "off".

Detailed Description Text (82):
In the next step, step 953, the overall luminous intensity of both a foreground colored pixel and a background colored pixel is determined. In one embodiment, for both the foreground and background colored pixels, this involves summing the red luminance value multiplied by a weighting factor of 0.3, the green luminance value by a weighting factor of 0.6, and the blue luminance value by a weighting factor of 0.1 as follows:

Detailed Description Text (118):
If in step 992 it was determined that gray scaling was not likely to improve the quality of the CURRENT PIXEL, operation proceeds to step 993. In step 993, a determination is made as to whether the color of the CURRENT PIXEL is different from both the foreground and background colors. This determination may be made by comparing the R, G, and B luminance intensity values of the CURRENT PIXEL to those of a foreground color pixel and a background color pixel. If in step 993 it is determined the color of the current pixel matches one of the foreground and background color pixels, no color artifact is present and processing returns, via RETURN step 984, to the place from which the sub-routine 970 was called with the CURRENT PIXEL's luminance intensity values being left unaltered.

Detailed Description Text (119):
If, however, in step 993 it is determined that the color of the current pixel differs from the foreground and background colors, operation proceeds to step 994. In step 994 a determination is made as to whether or not the color of the CURRENT PIXEL falls within a pre-selected acceptable range of colors corresponding to foreground/background color mixes. If the color of the current pixel falls within the pre-selected range, processing returns, via RETURN step 984, to the place from which the sub-routine 970 was called with the CURRENT PIXEL's luminance intensity values being left unaltered.

L5: Entry 14 of 137 File: USPT Jul 17, 2001

DOCUMENT-IDENTIFIER: US 6263091 B1
TITLE: System and method for identifying foreground and background portions of digitized images

Application Filing Date (1):
19980225

Detailed Description Text (17):
Step 405 is prior art block smoothing algorithm which smooths the input fingerprint gray scale image. See description of block 305 above in FIG. 3A. In additions blocks 425, 430, 435, and 440 are prior art steps as described in blocks 325, 330, 335, and 340 of FIG. 3A, respectively. Steps 410, 415, and 420 are novel and describe below.

Detailed Description Text (77):
In step 420, location of ridges are identified among the foreground blocks or regions extracted by the step 415. This step uses the preprocessed input gray-scale fingerprint image resulting from step 405 and the block directions computed in step 410. However, the process describe in detail below can generally be applied to any intensity images of tubular structures regions, e.g., ridges or valleys, in any image produced by light, general electromagnetic energy, ultrasound, or any other energy used in imaging systems.

Detailed Description Text (97):
The flowchart showing steps performed in extraction of the ridges (valleys) in one preferred embodiment illustrated in FIG. 14. For each pixel as a current line pixel in the foreground, the weighted summation GL and GR are performed (steps 1410 and 1420). If the weighted summations GL and GR are both negative (positive) and their magnitude are greater than a threshold value R (step 1430), the given foreground pixel is determined to be a center ridge (valley) pixel (step 1450). Otherwise, it is considered to be valley (ridge) pixel (step 1440).

Detailed Description Text (98):
Note it is quicker to find the ridge (or valley) pixels and after all the ridge (valley) pixels are identified, the valley (ridge) pixels are determined from the pixels which are not ridge (valley) pixels and belong to the foreground area.

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L5: Entry 24 of 137 File: USPT Jan 2, 2001

DOCUMENT-IDENTIFIER: US 6169816 B1
TITLE: Identification of objects of interest using multiple illumination schemes and finding overlap of features in corresponding multiple images

Application Filing Date (1):
19980504

Detailed Description Text (40):
Since the two images have been combined optically, they need to be separated digitally. As a first step to this end, a background gray level is determined at a step 150. In a specific implementation, the mode is used. Thus, the whole field is measured and a histogram of the number of pixels at each possible intensity level is constructed. The histogram is smoothed by adjacent averaging and the intensity corresponding to the top of the highest peak in the histogram is defined as the background value of light intensity. It would also be possible to use an average pixel value to specify the mid-level gray.

Detailed Description Text (41):
The combined images are separated at a step 155 into a below-the-background component, characterizing antibody absorption, and an above-the-background component, characterizing DAPI fluorescence. This is accomplished by comparing the background value determined in step 150 to the image on a pixel-by-pixel basis. This process is similar to a subtraction with saturation. This produces separate positive and negative-going images, which are essentially the two separate contrasts dissected from the single image.

Detailed Description Text (49):
At a step 160, a background is determined for the first image based on all pixels in the first image. If the first image is the fluorescent image, the background value is set equal to the value of the darkest (lowest intensity value) pixel in the image. At a step 162, this background is subtracted from all the pixels in the image. At a step 165, all pixels are compared to a threshold for the image, to generate a binary image. A pixel is considered to be "ON" if it is above the threshold (fluorescent image) or below the threshold (absorption image). The threshold is relatively high, since at this stage it is only desired to see whether features are present without attempting to determine their precise outlines.

First Hit Fwd Refs

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L5: Entry 32 of 137 File: USPT Jun 20, 2000

DOCUMENT-IDENTIFIER: US 6078051 A
TITLE: Image input device and method for providing scanning artifact detection

Application Filing Date (1):
19980108

Detailed Description Text (12):
To utilize these criteria in determining whether a particular pixel within a region is an image pixel (foreground) or a backing pixel, one embodiment of the present invention carries out a process as illustrated in FIG. 10. The process is based upon determining a cost value for a particular decision. For example, the process may determine the cost of classifying the pixel as a halftone versus classifying the pixel as background. In other words, the higher the cost, the less likely the classification will be correct. If the cost is at an acceptable minimum, the classification will be accepted for processing purposes. These cost levels can be adjusted to suit a particular risk comfort level.

Detailed Description Text (13):
The process as illustrated in FIG. 10 determines a fastscan cost value in Step S1. In addition to determining a fastscan cost value, Step S3 determines a slowscan cost value. Furthermore, Step S5 determines a video cost value for the pixel. After these three cost values are determined, an aggregate cost value is calculated at Step S7 wherein this aggregate cost value is utilized in determining whether the pixel is to be classified as a foreground pixel such that the image data is rendered or as a backing pixel wherein a background value is substituted for the image data and this background value is rendered at Step S9.

Detailed Description Text (29):
The final component of the cost function is a function of the gray value V(i,k) of the input image pixel Z. The background is known to be near black. If the measured gray value is above the 4 sigma light point of the backing, a cost is associated with that pixel; i.e.,

Detailed Description Text (34):
Too high input video gray level

Detailed Description Text (46):
Moreover, a fourth criteria could be added to the process above wherein the geometry (e.g., size) of the scanning artifact is detected, for example, to verify whether the size falls within a predetermined range. If the size of the scanning artifact falls outside that range, it could be determined that the pixel actually represents an image foreground region and not the backing of the scanning system.

Detailed Description Text (61):
In summary, the present invention provides a system and method for detecting whether a pixel is a result of a scanning artifact and properly processes the image data associated with that pixel accordingly. In one embodiment of the present invention, the present invention utilizes the variation of the video signal in the fastscan and slowscan direction as well as the gray level of the video signal to determine if a pixel represents a scanning artifact. In another embodiment of the the

present invention, the present invention utilizes the actual wavelength of the light being reflected from the backing or emitted therefrom to determine whether the pixel represents a scanning artifact or not.

First Hit Fwd Refs

Generate Collection Print

L5: Entry 43 of 137 File: USPT Nov 9, 1999

DOCUMENT-IDENTIFIER: US 5982943 A
TITLE: Method for determining background or object pixel for digitizing image data

Abstract Text (1):
A method for determining whether a pixel of a digitized image is a background or object pixel includes the steps of determining whether the pixel is in a static state or a transient state according to the variation in its gray-level compared with the gray-level of an adjacent pixel located in a first direction, setting a static threshold if the pixel is in the static state or a dynamic threshold if the pixel is in the transient state, comparing the gray-level of the pixel and the applicable threshold to determine whether the pixel is a background or object pixel, and repeating the determination with respect to static or dynamic thresholds, as applicable, in a second direction.

Application Filing Date (1):
19970415

Brief Summary Text (8):
The conventional method of determining whether a pixel is a "background" or "object" pixel is to use a constant or static threshold. As shown in FIGS. 2(a) and 3(a), some pixels that should be "background" are represented with a lower gray levels due to the effects of noise, and during processing of the image, are treated as "object" pixels, leading to undesired processing results. Consequently, it is necessary to minimize the number of noise pixels before an image file can be processed so that correct processing may be conducted.

Brief Summary Text (12):
The digital image processing industry is thus in need of a novel method to determine whether a pixel is an object or background pixel when the image to which the pixel belongs is obtained under natural illumination. It is also necessary to provide a dynamic threshold that can determine a pixel to be object or background according to the characteristics of the surrounding pixels.

Brief Summary Text (16):
Another object of this invention is to provide a method of establishing dynamic thresholds to determine whether a pixel is an object or background pixel according to the characteristics of its surrounding pixels.

Brief Summary Text (20):
The invention therefore provides a method for determining whether a digitized image data pixel is an object or background pixel which takes into account the variability of the pixels surrounding the pixel and establishes a dynamic threshold based thereon. As described herein, the method of the invention includes steps of:

Brief Summary Text (21):
assuming the pixel whose status is being determined to be background;

Brief Summary Text (25):
determining the pixel to be a background pixel or an object pixel according to the static state threshold, if the pixel is in a static state; and

Brief Summary Text (26):
determining the pixel to be a background pixel or an object pixel according to the transient state threshold, if the pixel is in a transient state.

Detailed Description Text (2):
The following is a description of a method according to the invention for determining whether a digitized image data pixel is an object pixel or a background pixel. FIG. 16 is a flow chart detailing the steps of the method of the preferred embodiment. As shown in this figure, the method of this invention includes the following steps: At 101, a first pixel is assumed to be background. The "first pixel" in this invention can be the pixel at the most upper left corner of the coordinate. In the determination of a pixel to be background or object, at 102, the gray level of its preceding pixel g(x,y-1) or g(x-1,y) is found. At 103 an upper limit for the deviation of the gray-level of the pixels (LSSD) is decided. At 104, if the deviation of gray-levels of two adjacent pixels (horizontally or vertically) is smaller than LSSD, the pixel is deemed in the "static state." Otherwise, it is deemed in the "transient state." If the pixel is in the static state, at 105, a static threshold t(n) is set according to the formula t(n)=t(n-1)+[g(n)-g(n-1)], where g(n) represents the gray-level of pixel n. If the pixel is in the transient state, at 106, a dynamic threshold t(n) is set according to the formula

Detailed Description Text (31):
After the threshold LSSD for deciding whether a pixel is in the static state or a transient state has been determined, whether the pixel is a background or object pixel can be determined according to a respective static threshold or a dynamic threshold, as follows:

Detailed Description Text (42):
3. t(n-1): the threshold to determine whether its preceding pixel is a background or object pixel.

Detailed Description Text (51):
FIGS. 6(a), 7(a) and 8(a) show three images obtained from an image scanner. FIGS. 6 (b)-(d), 7(b)-(d) and 8(b)-(d) show the gray levels of the pixels at certain horizontal or vertical lines (the solid lines) and the thresholds applicable to the individual pixels (the dotted lines). These figures clearly show that the thresholds so decided can accurately determine whether a pixel is an object or background pixel.

Detailed Description Text (53):
As the static thresholds and the dynamic thresholds are decided according to the preceding steps, the thresholds are used to determine whether a pixel is a background or object pixel. If the gray-level of a pixel is lower than the applicable threshold, it is deemed to be an object pixel. Otherwise, it is deemed to be a background pixel.

CLAIMS:

1. A method of using a computer system to determine whether digitized pixels of an image are background or object pixels, comprising the steps of:

assuming a first pixel to be background;

distinguishing, by taking the gray-level of a preceding pixel located in a first direction relative to the pixel as a reference, whether the pixel is in a static or a transient state;

setting a static threshold if the pixel is in a static state;

setting a dynamic threshold if the pixel is in a transient state;

adjusting the static threshold or the dynamic threshold according to a variation in gray-level in said first direction;

determining said pixel to be a background pixel or an object pixel according to the static threshold, if said pixel is in a static state; and

determining said pixel to be a background pixel or an object pixel according to the dynamic threshold, if said pixel is in a transient state, wherein said step of distinguishing whether the pixel is in a static or transient state comprises the steps of:

setting an upper limit of the gray-level deviation (LSSD);

comparing a gray-level deviation of two horizontally or vertically adjacent image pixels with said LSSD, and;

determining said pixels to be in a transient state when the gray-level deviation of said adjacent pixels is greater than said LSSD, and in a static state when the gray-level deviation of said adjacent pixels is smaller than said LSSD, and wherein said LSSD is between 4 and 9 when a pixel gray-level is divided into 256 levels.

3. A method of using a computer system to determine whether digitized pixels of an image are background or object pixels, comprising the steps of:

assuming a first pixel to be background;

distinguishing, by taking the pray-level of a preceding pixel located in a first direction relative to the pixel as a reference, whether the pixel is in a static or a transient state;

setting a static threshold if the pixel is in a static state;

setting a dynamic threshold if the pixel is in a transient state;

adjusting the static threshold or the dynamic threshold according to a variation in gray-level in said first direction;

determining said pixel to be a background pixel or an object pixel according to the static threshold, if said pixel is in a static state; and

determining said pixel to be a background pixel or an object pixel according to the dynamic threshold, if said pixel is in a transient state,

wherein the step of setting said static state pixel threshold comprises the steps of:

setting an upper limit of gray-level deviation between two adjacent pixels which are both background or object pixels; and

using said upper limit as a threshold for deciding whether a pixel is a background or object pixel.

5. The method as claimed in claim 3, wherein the step of setting said transient state pixel threshold comprises the steps of:

setting an upper limit of gray-level deviation between two adjacent pixels which are either both background or both object pixels; and

using said upper limit as a threshold for determining whether a pixel is a background or object pixel.

7. A method of using a computer system to determine whether digitized pixels of an image are background or object pixels, comprising the steps of:

assuming a first pixel to be background;

distinguishing, by taking the gray-level of a preceding pixel located in a first direction relative to the pixel as a reference, whether the pixel is in a static or a transient state;

setting a static threshold if the pixel is in a static state;

setting a dynamic threshold if the pixel is in a transient state;

adjusting the static threshold or the dynamic threshold according to a variation in gray-level in said first direction;

determining said pixel to be a background pixel or an object pixel according to the static threshold, if said pixel is in a static state; and

determining said pixel to be a background pixel or an object pixel according to the dynamic threshold, if said pixel is in a transient state,

wherein the step of setting said transient state pixel threshold comprises the steps of:

setting an upper limit of gray-level deviation between two adjacent pixels which are either both background or both object pixels; and

using said upper limit as a threshold for deciding whether a pixel is a background or object pixel,

wherein the step of adjusting said threshold comprises the steps of multiplying by an adjusted factor an absolute value of a difference between the gray-levels of said pixel and the pixel preceding said pixel, and then adding a result of the multiplication to the threshold of the preceding pixel, thereby obtaining the threshold value of said pixel, and

wherein said adjusted factor includes a function f, defined as follows:

f(n)=S* tan-1R(n),

wherein ##EQU6## where g(n) is the gray-level value of pixel number n, t(n-1) is the threshold of pixel number n-1, and S is a normalization factor, such that .vertline.S.times.tan.sup.-1 R(n)<1.

8. The method as claimed in claim 3, further comprising the steps of defining from a second direction a threshold for determining whether the pixel is a background or object pixel, and determining whether the pixel is a background or object pixel according to the thresholds defined from both the first and second directions.

9. A method of using a computer system to determine whether digitized pixels of an image are background or object pixels, comprising the steps of:

assuming a first pixel to be background;

distinguishing, by taking the gray-level of a preceding pixel located in a first direction relative to the pixel as a reference, whether the pixel is in a static or

a transient state;

setting a static threshold if the pixel is in a static state;

setting a dynamic threshold if the pixel is in a transient state;

adjusting the static threshold or the dynamic threshold according to a variation in gray-level in said first direction;

determining said pixel to be a background pixel or an object pixel according to the static threshold, if said pixel is in a static state;

determining said pixel to be a background pixel or an object pixel according to the dynamic threshold, if said pixel is in a transient state;

defining from a second direction a threshold for determining whether the pixel is a background or object pixel; and

determining whether the pixel is a background or object pixel according to the thresholds defined from both the first and second directions,

wherein said step of determining whether the pixel is a background or object pixel comprises the following steps:

A. determining the pixel to be an object pixel when the gray-level of said pixel {g (x,y)} is less than or equal to said first direction threshold {T1(x,y)} and said second direction threshold {T2(x,y)};

B. determining the pixel to be a background pixel when the gray-level of said pixel {g(x,y)} is higher than said first direction threshold {T1(x,y)} and said second direction threshold {T2(x,y)};

C. determining said pixel to be a background pixel if $T1(x,y)-g(x,y)<g(x,y)-T2(x,y)$, or

determining said pixel to be an object pixel if T1(x,y)-g(x,y).gtoreq.g(x,y)-T2 (x,y), when said gray-level of said pixel is less than or equal to the first direction threshold but higher than the second direction threshold; and

D. determining said pixel to be a background pixel if T2(x,y)-g(x,y).ltoreq.g(x,y)-T1(x,y), or

determining said pixel to be an object pixel if $T2(x,y)-g(x,y)>g(x,y)-T1(x,y)$, when said pixel's gray-level is higher than said first direction threshold but lower than or equal to said second direction threshold.

11. The method of claim 3, further comprising the step of converting into background pixels those pixels in the image data determined to be background pixels.

L5: Entry 96 of 137 File: USPT Nov 22, 1994

DOCUMENT-IDENTIFIER: US 5367382 A
TITLE: On-line microfilm storage and retrieval system

Application Filing Date (1):
19910906

Detailed Description Text (48):
(2) The grey scale may be fed to an integral image enhancement processor, which uses sophisticated algorithms in a context-sensitive way to determine for each pixel whether it is foreground or background. The output of the image enhancement processor is a binary image. The operation of the enhancer is in real time.

Detailed Description Text (95):
Very sophisticated image processing techniques are developed to enhance image quality. Analog information on film is digitized in to 256 grey levels. Convolution theorem is used to bring information out from the noisy data. Grey level of each pixel is read and compared with the expected value. Expected value is calculated based on the grey level information of the neighboring pixels. It takes trends into account for calculating expected values. When actual value and expected value is compared and difference is greater than tolerance allowed, then proper adjustments are made. Advanced filtering techniques are used. As a result of image processing, grey level data is converted to binary data. Alternate on board enhancement option is also available using look up tables. Grey level output, if required for external image processing is also available.

CLAIMS:

1. A microfilm storage and retrieval system comprising:

a) cartridge handling means for storing and retrieving microfilm cartridges comprising:

i) a rotatable center column assembly including a vertical column;

ii) a plurality of vertically stacked spoked hubs, each having a center ring disposed around the vertical column and from which a plurality of spokes extend, wherein the spokes form:

A) a plurality of essentially equally-spaced gaps within each of which one of the microfilm cartridges may be stored;

B) an additional gap larger than the equally-spaced gaps used to establish a rotational home position for the spider assembly and to establish a vertical column through which a selected one of the microfilm cartridges may pass through,

iii) and rotation means for rotating a selected one of the vertically stacked spoked hubs so that a selected one of the equally-spaced gaps may be aligned within the vertical column so that the selected one of the microfilm cartridges may pass vertically through;

b) a microfilm handling subsystem comprising:

i) elevator means for transporting the selected one of the microfilm cartridges from the selected one of the equally-spaced gaps through the vertical column and to a display position including

A) an elevator, and

B) electrical lifting means for raising and lowering the elevator through the vertical column;

ii) verification means for verifying that the spoked hub having the selected one of the equally-spaced gaps is the only one of the plurality of vertically-stacked spoked hubs rotated from its home position and for verifying that the elevator is below the selected one of the equally-spaced gaps; and

c) a video image processing subsystem comprising:

i) a projection means for projecting an image from a selected frame of microfilm onto a projection plane;

ii) a scanning array means comprising a linear array of sensors for converting light intensities on the projection plane into proportional electrical voltages,

iii) array moving means for moving the scanning array means through the projection plane, and

iv) an image enhancement processor means to determine for each of the proportional electrical voltages whether a pixel represented thereby is a foreground or a background pixel;

wherein each subsystem is accessible and controllable as part of a local area computer network.

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Generate Collection Print

L5: Entry 100 of 137 File: USPT Apr 19, 1994

DOCUMENT-IDENTIFIER: US 5305398 A
TITLE: Method and apparatus for scaling image data

Application Filing Date (1):
19891010

Detailed Description Text (85):
The subtractor 606 is used in cooperation with lookup table 608 and comparator 610 to determine the change in local contrast associated with exiting from a stroke within the image in question. Specifically, assembly 502 inputs the gray-scale value associated with pixels "P.sub.33 " and "P.sub.13 " to the subtractor 606 by bus 626. Assembly 502 also inputs to lookup table 608 the background gray-scale reference value associated therewith along the same bus 626. Subtractor 606 then subtracts the gray-scale value associated with the pixel "P.sub.13 " from the gray-scale associated with the pixel "P.sub.33 " and outputs the subtracted value to the table 608 by signals on bus 628.

Detailed Description Text (91):
Comparator 654 has a first input coupled to the gray-scale value of the active pixel (i.e. pixel "P.sub.33 ") obtained from the window shift register assembly 52 by bus 478 and a second input coupled to the background gray-scale reference signal 690 which is stored in the dynamic/fixed threshold memory 518 of FIG. 9 (and which will be explained later). Comparator 656 has a first input coupled to the current gradient magnitude via busses 488 and 492 from assembly 460 (FIG. 8) and a second input coupled to signal 682 which is a gradient threshold associated with an exit stroke of the active pixel (i.e., pixel "P.sub.33 ") and which is empirically defined by the user of image processor 24 and in the preferred embodiment of this invention, this exit stroke gradient threshold comprises a value of seven out of a possible range of 0 to 127.

Detailed Description Text (98):
The comparator 700 places its output signals on bus 706 to lookup table 702 which produces an output signal on bus 708 to the multiplexer 704. Multiplexer 704 has its input coupled to the signals on the bus 490 and receives an input associated with the background gray-scale reference value signal 690. The value of the dynamic threshold select signal carried by bus 490 is coupled to a select port of multiplexer 704. Multiplexer 704 produces an output upon bus 710.

Detailed Description Text (101):
Referring now to FIG. 14, there is shown further details of the remapper 714 of FIG. 7 as containing a remapped lookup table 714 having a first input coupled to the threshold present upon bus 710 and a second input coupled to the gray-scale value of the pixel in question which is present upon bus 490. The remapped lookup table 714 then compares the threshold value present upon the bus 710 with the gray-scale value of the pixel 490 and produces an output pixel value which is four bits long on bus 716.

Detailed Description Text (108):
Referring now to FIG. 15, there is shown further details of the background gray-level updater 474 FIG. 8 as containing a comparator 720, an AND gate 722, a

subtractor 724, a latch 726, a divisor 728, and an adder 730. Specifically, comparator 720 has a first input coupled to the computed threshold value signal on bus 710 and a second input coupled to the gray-scale associated with the pixel "P.sub.33 " by signals on bus 490. Additionally, the subtractor 724 has a first input coupled to the gray-scale value of the pixel "P.sub.33 " by signals on bus 490 and a second input coupled to the background gray-scale reference value, currently used, by signals on bus 490.

Detailed Description Text (109):
The dynamic threshold flag signal on bus 520 (which is coupled to bus 490) is also coupled to AND gate 722 at a first input thereof. An output of comparator 720 is coupled by bus 732 to a second input of AND gate 722, and an output of AND gate 722 is coupled to the control latch 726 by bus 734. An output of subtractor 724 is coupled to divisor 728 by bus 736 and an output of divisor 728 is coupled to a first input of adder 730 by signals on bus 738. An output of adder 730 is coupled to the latch 732 by signals on bus 740. Additionally, the adder 730 has a second input coupled to the background reference gray-scale value associated with signals on the 490, and the divisor 728 has a second input coupled to the background gray-scale reference update factor on bus 490. The background reference gray-scale update factor (signal 482) is empirically determined and loadable to image processor 24 through input/output controller 56. The new background reference factor is output from latch 726 and placed on bus 742.

Detailed Description Text (111):
In operation, the background reference gray-scale value will be updated by the cooperation of the comparator 720, subtractor 224, divisor 728, and adder 730. This background reference gray-scale updated value will be output if a signal on bus 734 enables this to occur. Specifically, the subtractor 724 will subtract the background gray-scale reference value from the gray-scale value of the pixel 458 (e.g., pixel "P.sub.33 ") and output the value upon the bus 736 to the divisor 728. The divisor 728 will divide the subtracted value by the background reference gray-scale value update factor which appears upon bus 490 and outputs this divided value via bus 738 to the adder 730. The adder 730 will then add the updated value to the current, existing gray-scale reference value (i.e., signal 482) and outputs the updated value upon the bus 740 to the input of latch 726. The data Will not be accepted by latch 726 until signal on bus 734 is logically high. That is, in order for the latch 726 to input the updated gray-scale value therefrom, the signal upon the bus 490 and the signal upon the bus 732 must both be logically high. This, in turn, requires comparator 720 to determine that the gray-scale pixel value associated with the active pixel 458 (i.e., "P.sub.33) appearing on bus 490 must be greater than the computed threshold value on bus 710. Additionally the dynamic thresholding signal on buses 490 and 520 must also be logically high. If these two aforementioned conditions are met, then the signal upon bus 734 is logically high and allows the latch 726 to output the updated gray-scale reference value, which is present upon the bus 742, therefrom.

Detailed Description Text (118):
A first input of comparator 820 is coupled to video input data on bus 82 and a second input thereof is coupled to input/output controller 56 by bus 846 which carries signals representing a gray-scale background reference. The reference, in the preferred embodiment of this invention has a value of 14. Its purpose is to distinguish between track background and current image data. The comparator 820 compare the video input (on a pixel by pixel basis) to that of the background reference present on bus 846 in order to determine if the pixel is of a document or background type. If the video input signal on bus 82 is whiter than or equal to the background reference signal on bus 846, then the comparator 820 issues a logical one upon bus 848 to the 5.times.1 bit shift register 822. When the 5.times.1 bit shift register 822 contains five consecutive values of one therein, a signal on bus 850 to the AND gate 828 is transmitted. A document-present signal (emanating from a camera assembly 11 FIG. 1) is placed on bus 852 and is coupled to a second input of

AND gate 828. The trailing edge of the signal upon bus 852 is also input into pulse generator 830 which causes a single pulse to emanate therefrom on bus 854 which is coupled to registers 832, 834, 836, and 838.